Education aAnd Medical Practice iIn Ancient Greece, tThe Alexandrian Period aAnd tThe Western Roman Empire. Advantages aAnd Disadvantages fFrom a A Contemporary Perspective.

ABSTRACT

During pre-Hippocratic times, medical education and practice in Greece were influenced by supernatural and religious beliefs. With Hippocrates of Cos, the doctor ceased to be a religious healer to become a naturalist, since he studied disease for the first time as an objective natural phenomenon. Medical schools were founded with a model of education of disciples, with great ethical content, without study plans or formal title. They prioritized observation over theory. Aristotle influenced medicine for more than 2,000 years. Even though he was not a physician, his contributions to medicine were substantial. He was considered the founder of comparative anatomy, created the Lyceum of Athens and emphasized the importance of one's own observation and experience to be a good doctor and not just a philosopher. Later, the leading role in medical education passed into the hands of the School of Alexandria, where the first chair of anatomy in history originated.In the cities of Cos, Cnido, and Alexandria medicine was taught with an educational model that persisted until the first part of the Middle Ages, based on: freedom (teacher and student defined their own goals), disciple learning (started from observation: " see how I do it so you can do it later"): teaching-learning process based on the experience over the texts; strong ethical content (do good and do no harm). During the Roman Empire, the Greek knowledge was preserved and strengthened by the hand of Claudius Galenus and progress was made in the construction of the first hospitals, an assortment of instruments and medical specialization. Both periods, Greek and Roman, were independent of religious influences; a situation that propitiated an exercise and a rational medical education. However, with few exceptions, there was no place for women.

Formatted: Highlight
Formatted: Right
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Left
Comment [NA1]: In the text, do not use the second person "you".

Keywords:

hippocrates, greek medical schools, aristotle, alexandrian school, claudius galenus, greco-roman medicine

Formatted: Font: Not Bold, Italic,

Formatted: Left

Formatted: Font: Italic, Highlight

Formatted: Highlight

Formatted: Font: Italic

1. INTRODUCTION

The time that includes the civilization of Ancient Greece, the Alexandrian period and the Western Roman Empire, takes place between the years 700 a.C and 476, when the Middle Ages began. This work aims to highlight the main aspects of a time that had advantages for the development of medicine and medical education.

There was still no intellectual control by the Catholic Church. There was a great intellectual exchange between the territories involved.Some of its main protagonists were Hippocrates of Cos, Aristotle, Herophilus of Chalcedon, Erasistratus of Cos, Dioscorides, Aulus Cornelius Celsus and Claudius Galenus. Each era will be developed chronologically, highlighting its main characteristics, contributions and protagonists [1]. ~~(Laín Entralgo, 1978)~~

2. PRE-HIPPOCRATIC PERIOD

Ancient Greece had as precedent civilizations the Minoan on the island of Crete, around 2000 BC, and the Mycenaean on continental Greece, between 1600 BC and 1100 BC[2]. ~~(Martin, 2000).~~ It emerged as a civilization around 700 BC and was divided into politically independent city-states, with Athens and Sparta being the most important.

Around 508 BC, a form of government called democracy or "government by the people" was introduced in Athens. Sports, theater, art, philosophy, politics and science had priority within this civilization. Despite the culture and religion that united the Greek cities, numerous rivalries existed, as exemplified by the Peloponnesian Wars (431-404 BC), between Athens and Sparta [3]. ~~(Pomeroy, 2004).~~

Ancient Greece was a deeply religious, anthropomorphic and polytheistic civilization[2]. ~~(Martin, 2000).~~ Pre-Hippocratic medicine was based on observation but had supernatural and religious preconceived notions. Towards the 8th century BC, there were several gods related to healing; the most famous were Apollo and his son Asclepius, later called Aesculapius by the Romans.Asclepius had two mortal sons, Macaon and Podalirius, and five immortal daughters: Hygieia, Aceso, Yaso, Eglee and Panacea, called the Asclepiades, all of them forming the so-called "sacred medical family of Greco-Latin mythology". All its members were dedicated to the health-disease process. From Hygieia (or Salus for the Romans) derive the words "hygiene". Macaon and Podalirius appear in Homer's Iliad and are considered the first military doctors [4]. ~~(José, González and Camejo, 2015).~~

Formatted: Left

Formatted: Highlight

Formatted: Left

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Many temples dedicated to Asclepius also functioned as hospitals. Patients stayed the night and upon awakening were prescribed a dream-based cure, which could be a combination of hydrotherapy, drama, poetry, music, dance, and diet [5](~~Emmanouil *et al.*, 2008~~). The followers of Asclepio practiced magical-religious medicine that was rationalized over the years.

Throughout the civilization of Ancient Greece there were exchanges with Babylonian [6],~~(Geller, 2004),~~ Egyptian ~~(Raju, 2003)~~ [7], Indian [8](~~Saber, 2010~~) and perhaps Chinese [9](~~Roth and Zhang, 2016~~) medical knowledge.

3. HIPPOCRATIC PERIOD

This period features Hippocrates of Cos (406-370 BC) considered the "father of medicine", since he studied disease for the first time as an objective natural phenomenon, separating it from magic and religion[10],~~(Campbell, 2009).~~ He tried to explain the phenomena of nature and its laws through critical reasoning.

Hippocrates of Cos approached the patient through anamnesis and the observation of clinical signs together with his disciples. From Hippocrates, the doctor ceased to be a priest to become a naturalist. For Hippocratic medicine, knowledge of the nature of diseases was impossible if the indivisibility between them was not recognized, since both the patient and his illness were united in a relationship in which the climate, food and physical traumas could be causal agents.

During the Hippocratic era, Greek doctors were characterized by constant curiosity and observation, which led to a rational explanation of what was seen[11, 12, 13].~~(Kleisiaris, et al., 2014;Temkin, 1953; Walker, 1990).~~ As a counterpart, there was a certain speculative tendency of the disease, such as hypotheses without empirical support. There was little anatomical knowledge, as dissections of human cadavers were prohibited in many places in Ancient Greece.

The cures depended, in the first place, on changes in diet and the prescription of physical exercises, followed by herbalism. Only in third place was surgery considered.

Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Left
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight
Formatted: Highlight

Aspiring surgeons were trained in military campaigns and two types of surgeries were performed: one manual (reduction of fractures) and another instrumental (using a scalpel) [5, 14, 15].~~(Emmanouil *et al.*, 2008; Torres, 2017; Gulczyński *et al.*, 2009).~~

During the era of Hippocratic medicine, knowledge came from superficial observation and inductive reasoning, with limited knowledge of anatomy and physiology. Despite this, great advances were made in the description of diseases through semiology.

The knowledge was compiled in a set of 72 books and 59 treatises, the *Corpus Hippocraticum*, compiled later by Ptolemy I in the Library of Alexandria [16].~~(Bercovitz, 2007).~~ The most important concept of Hippocratic medicine was "physis" or "nature of all objects in the universe". Medicine was the art of mastering what was random in nature and manifested itself in the form of disease.

The concept of medical semiology (*semeyon*: sign and *logos*: speech) studied the clinical signs. As such,the manifestations of a disease areevidenced through the doctor-patient relationship. Examples of Greek semiology that reached our days are Hippocratic facies (face close to the time of death), Hippocratic or clubbing fingers (due to heart, lung or liver disorders), puerperal fever (serious systemic infection after childbirth or abortion) and hippocratic succussion (exploratory movement and auscultation of the chest to detect pleural fluid).In addition, Hippocrates introduced numerous terms (e.g., symptom, trauma, sepsis) commonly used today, as well as names of diseases (diabetes, gastritis, arthritis, cancer, eclampsia, epilepsy, among others)[17].~~(Jones, 1868).~~

Hippocratic treatments sought to modify the four main humors: blood, mucus, yellow bile, and black bile. As surgical practices, venesection, phlebotomy or bloodletting were performed, which had to be carried out in certain astronomical lunar phases in order to eliminate phlegm.The therapeutic practice of phlebotomy was also practiced in Ancient India, Ancient Egypt and China from the 3rd century BC[18, 19, 20].~~(Magner, 1992;Montes, 2013; and Parapia, 2008).~~ In the Inca civilization to treat headaches, during the Arab period with Avicenna, with the Roman doctor Aurelio Cornelio Celso, in the Middle and Modern Ages in the West. From the year 1950 it is restricted to the treatment of some pathologies, such as hemochromatosis and polycythemia [8, 9].~~(Saber, 2010; Roth and Zhang, 2016).~~

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Comment [NA2]: In the text, do not use the first person "our".

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

The classical greek medical act was socially weighted if it made an accurate prognosis of the disease. That is, an accurate prognosis had more medical value than diagnosis and cure. But the prognosis was based on a previous questioning, since in order to predict, a detailed clinical history was essential.The physician defined himself as a subject of nature and did not consider illness as his enemy. Physicians generally practiced privately, although they were occasionally employed by the government to treat patients. They appeared before patients defending their reputation acquired in practice, since they lacked a legal certificate or qualifying title.[5].~~(Emmanouil et al, 2008).~~

Women avoided being attended by male doctors and there were the *maia* (midwife). They were women without formal education who collaborated with women's health and births.

Women and slaves could not study medicine [5]. ~~(Emmanouil *et al.*, 2008).~~ It is believed that in the Corpus Hippocraticum, the treatises on sterile women and women's diseases came from confidences made by midwives to doctors or by the women themselves [21].(de la Sierra Moral Lozano, 2011).

The medical student began his training from an early age, joining a medical school run by a doctor and made up of a group of practitioners and disciples. The applicant presented himself and was or was not accepted.

In theory, teaching was open to all men, although the kinship between the members of the school was not uncommon, existing family medical clans. Studies began with philosophy. According to the Greeks, love for man was the foundation of the art of healing. Therefore, the knowledge of man should be the basis of medical knowledge [22](García, 1998).

The readings and discussions of the texts differentiated the physician-philosophers from the uneducated empirical practitioners. The medical schools of Cyrene (see Fig~~ure~~ 1) are the oldest, according to the historian Herodotus. Other schools were Rhodes, Cnidus, Croton, Pergamum, and Alexandria, the latter founded by Herophilus and his disciple Erasistratus. The Cnidus school was focused on the treatment of disease, similar to the focus of today's medical schools. Cos's school was directed towards the patient [5].~~(Emmanouil *et al.*, 2008).~~

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Comment [NA3]: This should be checked (in the References).

Formatted: Highlight

Comment [NA4]: This should be checked (in the References).

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Figure 1. Ruins of Cyrene, present-day Libya. From Wikimedia Commons.

We can find references regarding the teaching of medicine in texts by Plato, Herodotus and Aristotle. Aristotle (384-322 BC), a disciple of Plato and tutor of Alexander the Great, was a philosopher and scientist. His thoughts influenced medicine for more than 2 000 years.Not being a doctor, his contributions to medicine were enormous.

Aristotle systematically treated the fields of botany, zoology, anatomy, embryology, teratology, and physiology.He is considered the founder of comparative anatomy, and, in embryology, he described the early development of the heart and great vessels and the differences between arteries and veins. His work also covered logic, psychology, meteorology, politics, literary criticism, and ethics [23].~~(Dunn, 2006).~~

He created the Lyceum of Athens (336 BC) (see Figure 2), where many free classes were offered. Aristotle conveyed his concept that the universal was always found in some way in the individual and particular, for which there would be a single reality, made up of individual things, generating the conceptual basis on the universality of science. In Nicomachean Ethics, his best-known work on ethics preserved to this day, written in 349 BC, Aristotle emphasized the importance of observation and experience to be a good doctor and not just a philosopher: “The doctor is not made exclusively for the study of the texts”.

Formatted: Font: Bold, Not Italic, Highlight

Formatted: Font: Bold, Not Italic, Highlight

Comment [NA5]: In the text, do not use the first person "we".

Formatted: Highlight

Formatted: Highlight

Figure 2. Gymnasia of Athens and Lykeion. Wikimedia Commons

In the cities of Cos (where the Hippocratic Oath originated), Cnidus and Alexandria, medicine was taught with an educational model that was maintained until the first part of the Western Middle Ages([24]Hajar 2017; Figure 3). A possible unified evaluation of students would have been difficult since there were hundreds of city-states.

Figure 3. Hippocratic Oath. Source: [24]Hajar 2017

Formatted: Font: Bold, Not Italic, Highlight
Formatted: Font: Bold, Not Italic, Highlight
Formatted: Font: Bold, Not Italic
Formatted: Highlight
Formatted: Highlight
Formatted: Font: Bold, Highlight
Formatted: Highlight

This medical educational model had the following characteristics [22, 25](García, 1998~~; Valdez García, 2019):~~

- Freedom. Master and student defined their own goals and maintained a brotherly bond. There was an absence of structure, courses, curricular plan and determined time to complete the studies. It was a close academic relationship between teacher and disciple, conducted through dialogues, exhibitions and debates. The teacher had the characteristics of a philosopher and physiologist, close to the ideal of Greek wisdom. A certain constructivist analogy can be inferred in educational methodology. Teaching was conceived as a student-centered process.
- Disciple learning that started from observation. This teacher-apprentice learning migrated later in history to teacher-student.
- Teaching-learning process based on clinical experience over texts. They used observation first, followed by rationalization and ending with discussion of the problem. Observation was prioritized over theory.
- Strong ethical content. The word “ethics” originates from the Greek *ethos*. It refers to a “set of values and habits accepted by the cultural tradition of a people”. According to Socrates, the good is the main universal foundation of ethics, therefore, it is the supreme end of man. Hippocrates agreed and considered two ethical principles that apply to medicine: do good or *bonum facere* and do no harm or *primum non nocere*.

During this time, the ethical duties of physicians became relevant and were written in the Hippocratic Oath (see Fig~~ure~~4). A commitment to act ethically and honestly with patients was established. Therefore, we can consider the Hippocratic Oath as "the fundamental document of Western medical ethics and the canonical text of medical paternalism" [26](Rodríguez *et al.*, 2014).

Comment [NA6]: This should be checked (in the References).

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Comment [NA7]: In the text, do not use the first person "we".

Comment [NA8]: This should be checked (in the References).

Formatted: Highlight

Figure 4. Text on papyrus: fragment of the Hippocratic Oath. Courtesy of Wellcome Library, London.

Formatted: Font: Bold, Not Italic, Highlight

Formatted: Font: Bold, Not Italic, Highlight

Formatted: Font: Bold, Not Italic

After Hippocrates, the cities of Rome and Alexandria took the leading role in terms of education and medical practice, due to the progressive decline of Athens after the Peloponnesian wars. In these wars, the cities formed by the Delos League (headed by Athens) and the Peloponnesian League (headed by Sparta) faced each other. This happened between the years 431 BC and 404 BC.

4. ALEXANDRINE PERIOD

Formatted: Left

Before its conquest by Alexander the Great (356-323 BC), the currently Egyptian territories belonged to the Persian Empire. In Alexandria, an Egyptian city founded in 331 BC by Alexander the Great and the center of Greek culture in Hellenistic times, there was a conflicting coexistence between Greeks and Egyptians. A great European, Asian, Jewish and Arab exchange converged there, which facilitated a great intellectual splendor around the year 200 BC.

During the year 300 BC, Ptolemy I, ruler of Egypt and founder of the Ptolemaic Macedonian dynasty, ruled the HellenisticEgypt. He ordered the construction of the largest scientific establishment in the world until then: the *museion*, which could be considered as the prototype of the contemporary college students. It had an institution of higher education in sciences and arts that received thousands of students, it had a huge library (see Fig ~~ure~~5), residences for professors, facilities where dissections were made on human cadavers and spaces in which animals and plants were studied [27].~~(Cask, 1940).~~

Fig ~~ure~~5. Ruins of the Serapeum of Alexandria, where the Library of Alexandria moved part of its collection, after running out of storage space in the main building. From Wikimedia Commons.

The School of Alexandria had great splendor during its first 100 years, preserving Greek knowledge and receiving students from other territories. Its graduates traveled, spreading knowledge to other parts of the Mediterranean. Its activity decreased after the fire in the year 391, which also devastated the library [28].~~(Serageldin, 2013).~~

In its beginnings, Greek doctors learned from Egyptian surgeons. The study of human anatomy began there with Herophilus of Chalcedon (335-280 BC), himself a disciple of Praxagoras of Cos. Praxagoras, together with his disciple Erasistratus of Cos (310-250 BC) (see Fig~~ure~~ 6), grandson of Aristotle, founded the first Department of Anatomy in history, with records of the practice of vivisection with animals and criminals. Herophilus, who is recognized as the father of anatomy, was a great anatomist, comparable only to Vesalius, and the first to carry out a systematic dissection of the human body [29].~~(Bay and Bay, 2010).~~

Formatted: Highlight

Formatted: Highlight

Formatted: Font: Bold, Not Italic, Highlight

Formatted: Font: Bold, Not Italic

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Fig.ure 6. Erasistratus. Sive de sanguinis missione. Lucas Antonius. Rome. Year 1682.

In the Alexandria School there were no examinations, and no titles were awarded. The fact of having studied there was considered sufficient to be able to practice medicine. Agnodice or Agnodike, a woman who pretended to be a man to study at the School of Alexandria with Herophilus, successfully practiced as a gynecologist and was brought to trial for "pretending to be a man to practice medicine" [30].(Livingston, 2015).

The library of Alexandria, which was housed within the *museion*, gradually declined following a purge of intellectuals in 145 BC. It later suffered a partial, unintentional fire by Julius Caesar in 48 BC.It suffered a partial destruction during the war between Emperor Aurelian and Queen Zenobia, in the year 272. And it received another important destruction in the year 391, by some Christians who had declared it a pagan place.

As of the year 260 there were few intellectuals there. One of the last was Hypatia of Alexandria (355-415), assassinated in 415. Subsequent disturbances, with the Arab invasion in 639, destroyed what little remained of the great library of Alexandria [31].(Phillips, 2010).Ptolemaic Egypt fell at the hands of Octavian in the year 30. Greek medicine found a place in the Roman Empire, more precisely in Rome.

5. ROMAN AGE

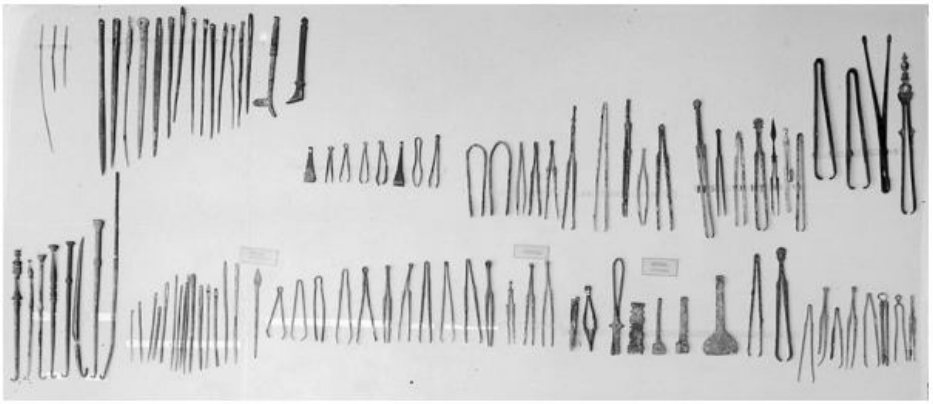
Formatted: Font: Bold, Not Italic, Highlight
Formatted: Font: Bold, Not Italic, Highlight
Formatted: Font: Bold, Not Italic
Formatted: Highlight
Formatted: Highlight
Formatted: Left

During the Roman era, which began in 146 BC with the Battle of Corinth, much of Greek philosophy, architecture, art, politics, language, literature, science, and medicine endured.The Romans had various forms of government: kingdom, republics with senators and emperors. For centuries, the Romans were cared for by Greek doctors and it was common to have a slave trained in medicine, called a *servus medicus*[32](García-Sancho, 2010).

Rome developed one of the world's most efficient and organized armies, with soldiers who received a salary. Such a military organization encouraged the practice of military surgeons and the development of field hospitals or *valetudinarium*[32](García-Sancho, 2010). *Julius Caesar* (100-44 BC) raised the status of physicians residing in Rome, granting them citizenship, many of them being of Greek origin or former slaves.

During the Roman Empire there were no hospitals, but there were hostels for sick slaves attended by medical slaves. As the number of slaves decreased in the Christian era, these shelters gave rise to the first hospitals (from the Latin *hospes*, guest) or *nosocomia* (from the Greek *noso*, illness, and *komeion*, to take care of). They allowed lower costs. Other important Roman contributions to medicine and medical education were instrumental creation (see Figure 7) and medical specialization [33].~~(Reda and Allam, 2007).~~

Dioscorides (c. 40 - c. 90) stands out among the Roman doctors. He was a physician and botanist who practiced during the Empire of Nero and wrote a masterpiece: *De materia medica*, which was the main pharmacopoeia manual during the Middle Ages and the Renaissance [34](Álvarez, 2017). *Aulus Cornelius Celsus* (25 BC - 50 AD) compiled medical knowledge from Hippocrates to Roman times in 8 books called *De re medica libri octo*[35].~~(Supady, 2020).~~



Comment [NA9]: This should be checked (in the References).

Formatted: Highlight

Comment [NA10]: This should be checked (in the References).

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Comment [NA11]: This should be checked (in the References).

Formatted: Highlight

Formatted: Highlight

Figure 7. Greco-Roman instruments. Replicas of instruments found at Silchester, Kolophon. From the Wellcome Historical Medical Museum.

Claudius Galenus (130-216), physician, surgeon and philosopher born in Pergamon, produced a work that brought together the Hippocratic tradition with elements of Plato and Aristotle. Although he dogmatized knowledge, he also tried to systematize it scientifically and influenced medicine for the next 1 400 years [36](García-Sancho, 2012). Galenism was based on the treatment of the imbalance of the four humors, diet, phlebotomies, the pharmacopoeia of plant origin and surgery performed by doctor-barbers.

Galen's contributions towards ocular anatomy and physiology had some errors later exposed by Andrea Vesalius (1514-1564). In Galen's time, human dissections were prohibited and therefore he performed them on animals, mainly dogs and Barbary apes [15].~~(Gulczyński *et al.*, 2009).~~ As a consequence, there were errors in their anatomy, such as the number of segments of the sternum and the belief that the humerus was the longest bone in the body.

6. END OF THE ROMAN PERIOD AND ITS CONSEQUENCES IN MEDICINE AND MEDICAL EDUCATION

In the year 380, the Roman Emperor Theodosius I proclaimed Christianity by decree as the exclusive religion of the Empire [37].~~(Sáry, 2019).~~ This decree changed medicine and medical education in the Western world.After Theodosius I's death in 395, the Empire was divided into a western portion for his son Honorius and an eastern portion for his son Arcadius. Finally, in the year 476, the last Western Roman Emperor, *Romulus Augustulus*, was overthrown by Germanic invasions, beginning the Western Middle Ages.

Meanwhile, the Eastern portion of the Roman Empire remained under the name of the Byzantine Empire. Greek medical knowledge and educational characteristics were preserved and expanded there until 1453, when the city of Constantinople (present-day Istanbul, Turkey) fell to the Ottoman Empire.

7. CONCLUSIONS

Formatted: Font: Bold, Not Italic,
Formatted: Font: Bold, Not Italic,
Formatted: Font: Bold, Not Italic
Comment [NA12]: This should be checked (in the References).
Formatted: Highlight
Formatted: Highlight
Formatted: Left
Formatted: Highlight
Formatted: Left

The period between 800 BC and 476, with the presence of Greek and Roman medical and educational-medical knowledge, was a time when medicine was separated from religion, however some difficulty in the last 100 years of the Roman Empire was present.

Such autonomy was the engine for many advances in the development of semiology, anatomy, herbalism, surgery and medical education. The towns of Cnidus and Cos, later Alexandria and Rome, were model cities with respect to Greco-Roman medical education.

Even though it was a period of great intellectual wealth, there was no place for the medical education of women. This situation would later change with the Medical School of Salerno, founded in the 9th century.

REFERENCES

Alvarez, B. T. (2017). Medical matters [Internet]. Magazine C2. https://www.journal2.com/matter-medical/

29. Bay , N. S. Y. , & Bay , B. H. (2010). Greek anatomist Herophilus: the father of anatomy. Anatomy & Cell Biology, 43(4), 280-283.

16.Bercovitz , L. K. (2007). Medicine in times of Hippocrates. Medical Journal of the University of Veracruzana, 7(1), 59-62.http://dx.doi.org/10.1037/0021-843X.111.2.212

Rodriguez, O. F., Soliz Soliz, R., Field, Rodriguez, O., & Zuñiga Cuno, W. (2014). Hippocrates of Cos, Father of Medicine and Medical Ethics Hippocrates, Father of Medicine and Medical Ethics. Notebooks Hospital Clinics, 55(4), 59-68.

10. Campbell, C. 2009. Talk about homeopathy: discursive strategies as ways to continually marginalise homeopathy from mainstream acceptance. PhD thesis. Queen Margaret University.

27. Cask , G. E. (1940). Early Medical Schools. III: The School of Alexandria. Annals of Medical History, 2(5), 383.

23. Dunn , P. M. (2006). Aristotle (384–322 BC): philosopher and scientist of ancient Greece. Archives of Disease in Childhood-Fetal and Neonatal Edition, 91(1), F75-F77.

Comment [NA13]: These references should be rearranged according to this example [Boateng R, Mbrokoh AS, Boateng L, Senyo PK, Ansong E. Determinants of elearning adoption among students of developing countries. Int. J. Inf. Learn. Technol. 2016;33(4):248–262.]

Formatted: Left

Comment [NA14]: This should be checked (in the text).

Formatted: Highlight

Formatted: Highlight

Comment [NA15]: This should be checked (in the text).

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

5.Emmanouil , P. , Pavlos , M. , Efthimios , D. A. , Sofia , A. , & Christos , T. (2008). Evolution of medical education in ancient Greece. Chinese Medical Journal, 121(21), 2202-2206.

Garcia , O. E. S. (1998). A historical overview of medical education. In: Annals of the School of Medicine (Vol. 59, No. 3, pp. 215-219). National University of San Marcos.

24. Hajar R. (2017). The Physician's Oath: Historical Perspectives. Heart Views, 18(4):154-159. doi: 10.4103/HEARTVIEWS.HEARTVIEWS_131_17. PMID: 29326783; PMCID: PMC5755201.

17.Jones, W. H. (1868). The Collected Works of Hippocrates I. Cambridge Harvard University Press. Retrieved on March 25,

Garcia-Sancho, M. (2012). Surgery. Concept. Historical landmarks. In: Mountains, J.A.R., Fragues, F.N. (eds.). General surgical pathology. Ramon Areces University Publishing House.

6. Geller , M. J. (2004). West meets East: early Greek and Babylonian diagnosis. In: Magic and Rationality in Ancient Near Eastern and Graeco-Roman Medicine (pp. 11-61). Brill.

15. Gulczyński , J. , Iżycka-Świeszewska , E. , & Grzybiak , M. (2009). Short history of the autopsy Part I. From prehistory to the middle of the 16th century. Polish Journal of Pathology, 60(3), 109-114.

4.José , E. , Gonzalez , L. , & Camejo , Z. V. (2015). Sclepius (Aesculapius) and his family in Western mythology and medicine. Health, 19(2), 24-30.

11. Kleisiaris, C.F., Sfakianakis, C., Papathanasiou, I.V. (2014). Health care practices in ancient Greece: The Hippocratic ideal. Journal of Medical Ethics and History of Medicine, 15;7:6. PMID: 25512827; PMCID: PMC4263393.

1. Laín Entralgo,Pedro (1978). History of Medicine. Alicante : Biblioteca Virtual Miguel de Cervantes, 2014.https://www.cervantesvirtual.com/nd/ark:/59851/bmcqj991

30.Livingston , R. S. (2015). Women in medicine: past, present, & future. Carbondale (IL): Southern Illinois University Carbondale.

Formatted: Highlight

Comment [NA16]: This should be checked (in the text).

Formatted: Highlight

Formatted: Highlight

Comment [NA17]: This should be checked (in the text).

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Lozano, M. D. L. S. M. (2011). Women and medicine in classical antiquity: the figure of the midwife and the beginnings of western gynecology. Frontiers: Journal of History, 13(24), 45-60.

18. Magner, L.N. (1992). A History of Medicine. New York: Marcel Dekker

2.Martin, T.R (2000). Ancient Greece from prehistoric to Hellenistic times, 2nd ed. New Haven: Yale University Press.

19.Montes, J. A. R. (2013). Therapeutic bleeding: from rite to Science. Bulletin of the Malaguean Academy of Sciences, (15), 7-20.

20.Parapia, L. A. (2008). History of bloodletting by phlebotomy. British Journal of Hematology, 143(4), 490-495.

31. Phillips , H. (2010). Great Library of Alexandria. Library philosophy and practice, (Aug.).

4. Pomeroy , S. B. , Burstein , S. M. , Donlan , W. , & Roberts , J. T. (2004). A brief history of ancient Greece. Politics, Society, and Culture (Oxford and New York 2004), 213.

7. Raju, V. K. (2003). Susruta of ancient India. Indian Journal of Ophthalmology, 51(2), 119-122.

33. Reda , M , Allam , K (2007). The Roman Physicians in the Light of Some Private Funerary Inscriptions. Bulletin of the Center for Papyrological Studies, 24(1), 101-123.

9. Roth , A. , & Zhang , H. (2016). A dialogue on traditional medicine: east meets west. Chinese Media Research, 12(4), 85-92.

6. Saber, A. (2010). Ancient Egyptian Surgical Heritage. Journal of Investigative Surgery, 23(6), 327-334.

37. Sáry, P. (2019). Remarks on the Edict of Thessalonica of 380. In: Honori Dedicata Pocta Petrovi Blahovi K Nedožitým 80. Narodeninám (pp. 67-80). Trnavska University v Trnave.

28. Serageldin, I. (2013). Ancient Alexandria and the Dawn of Medical Science. Global Cardiology Science & Practice, 2013(4),395.

35.Supady, J. (2020). Aulus Cornelius Celsus–a famous Roman encyclopedist. Health Promotion & Physical Activity, 10(1), 20-22.

Comment [NA18]: This should be checked (in the text).

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

12. Temkin, O. (1953). Greek Medicine as Science and Craft. Isis, 44(3), 213–225. http://www.jstor.org/stable/227086

14. Torres, M. R. (2017). The ophthalmology since antiquity. Cuban Journal of Ophthalmology, 30(2), 1-16.

25. Valdez-Garcia, J. E. (2019). Brief history of medical education. Rev Advances, 1, 37-38.

13. Walker, H.K. (1990). The Origins of the History and Physical Examination. In: Walker HK, Hall WD, Hurst JW, editors. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Boston: Butterworths. Chapter 1. Available from: https://www.ncbi.nlm.nih.gov/books/NBK458/

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight

Formatted: Highlight